

ALUMINUM

Project Fact Sheet



IMPROVED GRAIN REFINEMENT PROCESS FOR ALUMINUM

BENEFITS

- Potential cost savings of \$14 million per year by 2010 by lowering the cost of grain refinement
- Potential energy savings of two trillion British thermal units (Btu) annually by 2010 by eliminating a step used in the conventional process
- Potential elimination of several million pounds per year of spent salt
- Potentially higher furnace productivity and reduced process scrap

APPLICATIONS

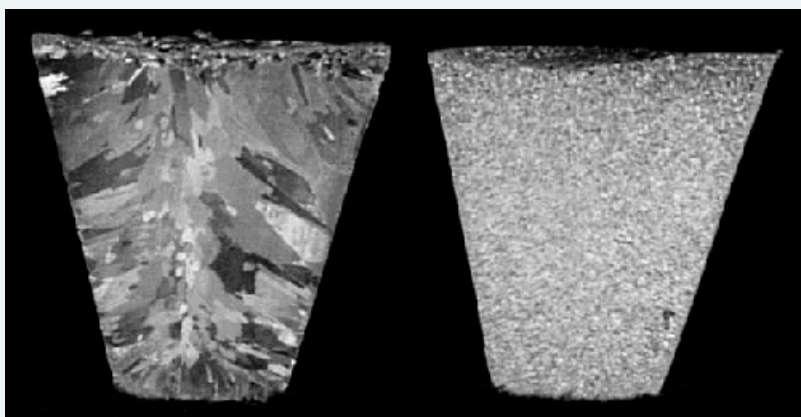
The fy-Gem process can be used as an effective way to refine aluminum castings, resulting in high quality ingots, and offers significant cost, energy, and environmental benefits. The new process can be applied worldwide, since almost all aluminum alloys need to be grain refined.

NEW EFFECTIVE METHOD WILL PRODUCE CLEANER, HIGHER-QUALITY ALUMINUM CASTINGS

Almost all aluminum cast in the U.S. is grain refined, and the amount of grain refiner consumed in primary plants averages about two pounds per metric ton. The amount used in secondary plants is less, probably about one pound per metric ton. The cost to the U.S. aluminum industry to grain refine aluminum is approximately \$23 million dollars per year. The master alloys used for refinement in the U.S. today represent an aluminum consumption of about 10 million pounds per year. The current master alloy grain refiners are made by reacting liquid aluminum metal with salts containing titanium and boron. Because the present method of producing grain refiners involves the reaction of salts with aluminum, for each pound of Al-Ti-B (aluminum-titanium-boron) master alloy, about 0.28 pounds of spent salt (a potassium-aluminum fluoride) is produced. The total spent salt generated, which corresponds to master alloy consumption in the U.S., is about 2.9 million pounds each year.

A new method of grain refining aluminum, called the fy-Gem process, has been demonstrated in a JDC, Inc. laboratory program to be an effective way to refine aluminum castings. This invention (patent applied for) offers significant cost, energy and environmental benefits, and addresses the important issue of how to produce ingots of higher quality, particularly with respect to boride inclusion. The fy-Gem process addresses the problems and costs associated with the use of titanium and boron in grain refiners and is likely to result in cleaner, higher quality castings.

FY-GEM PROCESS



Grain structure observed before and after novel process.



Project Description

Goals: Test and demonstrate the new grain refining process (fy-Gem) and bring it to the point where it is a commercially viable system.

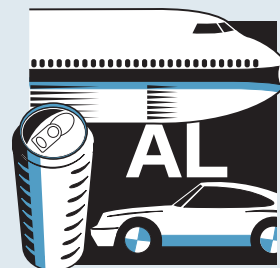
The fy-Gem method of grain refinement is a relatively new technology, so additional research and development is needed before it can be commercialized. The technical feasibility of the fy-Gem process has been demonstrated in the laboratory. This project is aimed at establishing commercial viability and reliability in the cast shop.

Progress and Milestones

- Complete Laboratory Experiments (Spring 1999)
- Perform and Evaluate Cast Shop Experiments (Spring/Summer 1999)
- Develop Commercial Sources of Raw Material Used in the Process and Safe Reliable Ways of Delivering It to Casting Pits (Summer 1999)
- Design of the First Commercial Scale System (Fall 1999)

Commercialization Plan

If the development and demonstration is successful, the project partners expect to introduce the grain refinement method into the market place in 1999 or 2000. They hope to quickly capture a significant portion of the primary aluminum smelter and aluminum foundry markets worldwide. Relatively fast introduction into the market is possible because the small capital cost of the new additive feeding equipment required is more than offset by lower energy and operating costs.



PROJECT PARTNERS

Alcoa Incorporated
Alcoa Technical Center
Alcoa Center, PA

GKS Engineering Services
Johnstown, PA

GRAS, Inc. (Grain Refining
and Alloying Services)
Murrysville, PA

JDC, Inc.
(sister companies:
Jamegy, Inc. and CM Tech Inc.)
New Cumberland, WV

Littlestown Hardware and Foundry
Littlestown, PA

Touchstone Laboratory
Triadelphia, WV

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

Sara Dillich
Office of Industrial Technologies
Phone: (202) 586-7925
Fax: (202) 586-1658
sara.dillich@ee.doe.gov
<http://www.oit.doe.gov/IOF/aluminum>

Please send any comments,
questions, or suggestions to
webmaster.oit@ee.doe.gov.

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Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585



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